60th Annual Meeting of the EAAP, Barcelona 2009
Session nr 40
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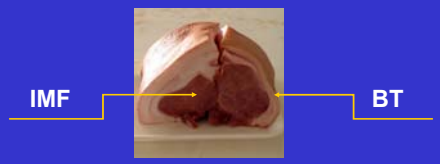
Selection for intramuscular fat content and fatty acid composition in a Duroc pig line



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Grant CICYT AGL2006-01243 - BIOGIM

Background

- IMF content & composition are important traits for high-quality dry-cured ham
- IMF can be selected successfully
  - ✓ $h^2 = 0.58$
- at expense of increased BT
  - ✓ $r_{IMF, BT}$: 0.64 & $r_{IMF, BW}$: 0.34
- There is room for improving both IMF & BT

(Solanes et al., 2009)

Objectives

- Prove experimentally that BT can be decreased by selection without changing IMF
- Estimate correlated responses in BW & carcass traits
- Evaluate opportunities for changing IMF fatty acid composition by selection

Experimental design

Data, 180 days
BW: 38,441
BT: 37,698
IMF: 3,066

Model
$Y = Sex + batch + a + litter + b_{age\ (or\ carcass\ weight)}$
$\hat{a}_{BT}$, $\hat{a}_{IMF}$, $\hat{a}_{BW}$

4 batches

Litter breeding value
$\hat{a}_{LITTER} = (\hat{a}_{SIRE} + \hat{a}_{DAM}) / 2$

Group C (random)

Group S
$\hat{a}_{BT}$
$\hat{a}_{IMF}$
$\hat{a}_{BW}$

2 castrated / litter

Selection differential (S-C)

	n_c	n_S	BT (mm)	IMF (%)	BW (kg)
Batch 1	52	55	- 0.75	+ 0.13	- 0.91
Batch 2	56	50	- 0.64	- 0.02	- 0.74
Batch 3	39	33	- 0.85	+ 0.04	- 0.39
Batch 4	41	34	- 0.98	- 0.03	- 0.60
Total	188	172	- 0.78	+ 0.03	- 0.70

Sire, dams & pigs per group

			Pigs with data		
Group	Sires	Dams	BT	IMFGM	IMFLM
Selected	39	100	172	159	41
Control	48	107	188	179	47

Methods

- IMF content and FA composition were determined in duplicate by quantitative GC (Bosch et al, 2009)
  - ✓ IMF = ∑ 11 FA
- Response was estimated as S – C
  - ✓ Y = group (S, C) + batch + b $_{\text{age (carcass weight)}}$

Response in BT, mm

	Group	
Age, days	S	C
120	9.9[a]	10.9[b]
160	14.1[a]	15.5[b]
180	16.2[a]	17.8[b]
210	19.4[a]	20.7[b]

Response in IMF content & composition, 210 d

	Group	
	S	C
Gluteus Medius,%		
IMF	4.3	4.4
MUFA	50.7	51.2
Oleic FA	46.2	46.6
Longissimus dorsi, %		
IMF	3.5	3.7
MUFA	52.2	52.3
Oleic FA	47.2	47.3

Response in body weight, kg

	Group	
Age, days	S	C
120	57.4[a]	59.4[b]
160	88.3[a]	90.9[b]
180	103.3[a]	106.4[b]
210	122.1[a]	125.8[b]

Response in carcass traits

	Group	
	S	C
at 215 days		
Carcass weight, kg	94.8[a]	97.6[b]
Weight of hams, kg	24.3	24.6
Lean content, %	48.8[a]	48.0[b]
at 95 kg		
BT, mm	22.9	23.4
Weight of hams, kg	24.4[a]	24.1[b]
Lean content, %	48.5	48.1

Conclusions

- Selection against BT at restrained IMF decreased BT at no change in IMF
- but led to unfavourable correlated response in growth traits
- - although not in the weight of hams

Methods/2

- Data
  - ✓ 879 GM from barrows at 210 days
- Genetic parameters for IMF FA were estimated in a series of trivariate analyses
  - ✓ Y = batch (12) + animal (4616) + b $_{age\ (or\ cw)}$
  - ✓ TM programme (Legarra et al., 2008)

Genetic parameters for IMF FA, 210 days

	h^2	σ_a	r_g MUFA$_{210}$	r_g OLEIC$_{210}$
IMF$_{210}$	0.52	1.30	0.57	0.55
OLEIC$_{210}$	0.52	1.48	0.97	-

Genetic correlations of IMF & OL with BW &BT

	BW$_{180}$	BT$_{180}$	BW$_{210}$	BT$_{210}$
IMF$_{210}$	- 0.43	0.18	- 0.44	0.09
OLEIC$_{210}$	- 0.54	- 0.04	- 0.52	-0.03

Genetic correlations of IMF & OL with BW &BT

	IMF$_{210}$	OL$_{210}$	BW$_{210}$	BT$_{210}$
ΔBW$_{(210-180)}$	0.16	0.03	0.19	- 0.09
ΔBT$_{(210-180)}$	- 0.08	0.21	0.07	0.74

Conclusions/2

- Selection for oleic FA is expected to increase IMF at no change in BT
- …but it also would decrease BW
- Emphasis on growth rate at the late fattening period would help to maintain BW